

## Radiofrequency Ablation: The Use of Appropriate Terms and the Citation of Prior Art

### From:

Prof. Dr. Yicheng Ni<sup>1</sup>  
 Dr. Stefaan Mulier<sup>1,2</sup>  
 Dr. Feng Chen<sup>1</sup>  
 Dr. Olivier Lescroart<sup>3</sup>  
 Dr. Ivo Roelants<sup>3</sup>  
 Dr. Guy Marchal<sup>1</sup>

<sup>1</sup>Department of Radiology, University Hospitals, Catholic University of Leuven, Belgium

<sup>2</sup>Department of Surgery, University Hospital of Mont-Godinne, Catholic University of Louvain, Yvoir, Belgium

<sup>3</sup>Section of Intellectual Property, Leuven Research and Development, Catholic University of Leuven, Belgium

To The Editor,

We read with interest the paper by Lee JM et al from the March issue of *Academic Radiology* [1]. We are delighted to notice that their *in vivo* results strongly support our proof-of-principle papers published six years ago [2,3] where promising *in vivo* and *ex vivo* outcomes with radiofrequency ablation (RFA) in the liver were reported by using the patented “cooled-wet” electrode that combines the advantageous features of the preexisting “cooled” and “wet” electrodes [2-5]. However, two major issues in the paper have drawn our attention and motivated us to write this letter for opening a discussion.

The first issue is about the nomenclature of the applied RFA electrode. Recently a few proposals have been published to advocate standardization of the terminology related to tumor ablation technologies including RFA [6-9]. Despite a lack of perfect consensus, one single term should be constantly used for nominating a certain device to minimize the semantic chaos already present in this field. However, for a virtually identical device, i.e. a cooled-wet electrode in either monopolar or bipolar applications, this group has used, in their multiple publications, at least five different names including internally cooled perfusion electrode [1], perfused-cooled electrode [10-15], wet-cooled electrode [16], perfusion-cooled electrode [17], and cooled-wet electrode [18,19].

Regarding the specific terminology for this type of device, we prefer to use the given name cooled-wet electrode as we initiated from the very beginning [2-5]. The rationales for naming the respective cooled and wet electrodes are detailed elsewhere by an international panel of authors [6]. The development of the cooled-wet electrode was based on the commercially available cooled electrode [1-19], chronologically it is more logical to nominate “cooled” first and “wet” second in its full name.

The second issue is about academic honesty. We pioneered cooled-wet electrode for improving the efficacy of RFA [2-5]. However, when they introduced their similar device with the identical features, i.e. combined internal cooling perfusion and interstitial saline infusion in a single electrode [1], the authors did not mention our prior art [2-4], of which they are certainly aware [13,14,16,18,19]. Such a practice has recently been strongly condemned and should not be encouraged in our academic forum [20].

### REFERENCES

1. Lee JM, Han JK, Chang JM, Chung SY, Kim SH, Lee JY, Lee MW, Choi BI. Radiofrequency ablation of the porcine liver *in vivo*: increased coagulation with an internally cooled perfusion electrode. *Acad Radiol* 2006 Mar; 13(3):343-52.
2. Ni Y, Miao Y, Mulier S, Yu J, Baert AL, Marchal G. A novel “cooled-wet” electrode for radiofrequency ablation. *Eur Radiol* 2000; 10(5): 852-4.
3. Miao Y, Ni Y, Yu J, Marchal G. A comparative study on validation of a novel “cooled-wet” electrode for radiofrequency liver ablation. *Invest Radiol* 2000; 35: 438-44.
4. Ni Y, Miao Y, Marchal G. Cooled-wet electrode. United States Patent: US 6,514,251 B1. Date of patent: February 4, 2003; Priority date: August 14, 1998.
5. Ni Y, Mulier S, Miao Y, Michel L, Marchal G. A review of the general aspects of radiofrequency ablation. *Abdominal Imaging* 2005; 30: 381-400.
6. Goldberg SN, Charboneau JW, Dodd GD III, et al. Image-guided tumor ablation: proposal for standardization of terms and reporting criteria. *Radiology* 2003; 228:335-345.
7. Mulier S, Miao Y, Mulier P, et al. Electrodes and multiple electrode systems for radiofrequency ablation: A proposal for updated terminology. *Eur Radiol* 2005; 15(4): 798-808.
8. Goldberg SN, Grassi CJ, Cardella JF, et al. Image-guided tumor ablation: standardization of terminology and reporting criteria. *Radiology* 2005; 235 Jun:728-739.
9. Goldberg SN, Grassi CJ, Cardella JF, et al. Image-guided tumor ablation: standardization of terminology and reporting criteria. *J Vasc Interv Radiol* 2005 Jun;16(6):765-78.
10. Lee JM, Han JK, Kim SH, Lee JY, Kim DJ, Lee MW, Cho GG, Han CJ, Choi BI. Saline-enhanced hepatic radiofrequency ablation using a perfused-cooled electrode: comparison of dual probe bipolar mode with monopolar and single probe bipolar modes. *Korean J Radiol* 2004 Apr-Jun;5(2):121-7.

11. Lee JM, Han JK, Kim SH, Lee JY, Shin KS, Han CJ, Lee MW, Choi JI, Choi BI. Optimization of wet radiofrequency ablation using a perfused-cooled electrode: a comparative study in ex vivo bovine livers. *Korean J Radiol* 2004 Oct-Dec;5(4):250-7.
12. Lee JM, Han JK, Kim SH, Shin KS, Lee JY, Park HS, Hur H, Choi BI. Comparison of wet radiofrequency ablation with dry radiofrequency ablation and radiofrequency ablation using hypertonic saline preinjection: ex vivo bovine liver. *Korean J Radiol* 2004; 5: 258-65.
13. Lee JM, Han JK, Kim SH, Lee JY, Choi SH, Choi BI. Hepatic bipolar radiofrequency ablation using perfused-cooled electrodes: a comparative study in the ex vivo bovine liver. *Br J Radiol* 2004 Nov; 77(923):944-9.
14. Lee JM, Han JK, Choi SH, Kim SH, Lee JY, Shin KS, Han CJ, Choi BI. Comparison of renal ablation with monopolar radiofrequency and hypertonic-saline-augmented bipolar radiofrequency: in vitro and in vivo experimental studies. *Am J Roentgenol* 2005 Mar; 184(3):897-905.
15. Lee JM, Han JK, Kim SH, Han CJ, An SK, Lee JY, Choi BI. Wet radiofrequency ablation using multiple electrodes: comparative study of bipolar versus monopolar modes in the bovine liver. *Eur J Radiol* 2005 Jun; 54: 408-17.
16. Lee JM, Han JK, Kim SH, Choi SH, An SK, Han CJ, Choi BI. Bipolar radiofrequency ablation using wet-cooled electrodes: an in vitro experimental study in bovine liver. *Am J Roentgenol* 2005 Feb; 184(2):391-7.
17. Lee JM, Han JK, Kim SH, Lee JY, Shin KS, Choi BI. An ex-vivo experimental study on optimization of bipolar radiofrequency liver ablation using perfusion-cooled electrodes. *Acta Radiol* 2005 Aug; 46(5):443-51.
18. Lee JM, Han JK, Kim SH, Sohn KL, Choi SH, Choi BI. Bipolar radiofrequency ablation in ex vivo bovine liver with the open-perfused system versus the cooled-wet system. *Eur Radiol* 2005 Apr; 15(4): 759-64.
19. Lee JM, Han JK, Kim SH, Lee JY, Park HS, Eo H, Choi BI. Radiofrequency ablation in the liver using two cooled-wet electrodes in the bipolar mode. *Eur Radiol* 2005 Oct; 15(10): 2163-70.
20. Buchler MW, Farthmann EH. Consensus statement on submission and publication of manuscripts. *Dig Surg* 2001;18(3):163-4.

### Response to Ni Letter to the Editor

Drs. Lee and Han respond:

Let us begin by showing our appreciation for the attention that our work (1) has been given and state our utmost respect for Dr. Ni and his colleagues' contributions in the field of radiofrequency ablation. We have carefully reviewed their recent letter to the editor concerning radiofrequency ablation using the "internally cooled perfusion electrode" or "cooled-wet" electrode as was otherwise suggested and wish to issue the following response.

First, let us address the issue of nomenclature. We completely agree with the opinion that one single term should be consistently used for nominating any specific device, and admit that one single term was not used for nominating the electrode that allows the interstitial infusion of saline and intra-electrode cooling in our previous publications. However, despite their urging for the use of the term "cooled-wet" electrode, we would prefer to use the term, "internally cooled perfusion electrode" as endorsed by the leading experts groups in the field of radio-

frequency ablation and as indicated in our study. The rationale for using this term to nominate the internally cooled perfusion electrodes are detailed in the proposals which were recommended by the Society of Interventional Radiology's Technology Assessment Committee and the International Working Group on Image-Guided Tumor Ablation, who are both highly respected experts groups in the field of tumor ablation (2-4). According to the proposals, ambiguous descriptions such as "cool-wet" or "wet" electrodes were not recommended due to its imprecise description and characterization of the applicator (5). Given that radiofrequency ablation induces heat production and desiccation of the tissue where radiofrequency energy is delivered, we believe that many readers will not easily and intuitively understand the term "cooled-wet" electrode. Furthermore, it is also our belief that expert groups or international committees should be the final arbiter in deciding specific terminology, not individuals or groups of individuals.

Regarding the second issue raised by Dr. Ni and his colleagues, we agree with their opinion that readers should be provided with direct references to original research sources whenever possible, and wish to politely answer that we are well aware of the pioneering work by Dr Ni et al (6,7) and have indicated their previous works in detail in our previous ex vivo studies using the internally cooled perfusion electrode that was listed in the Reference section of our paper (References No. 20 and 21). Due in part to the closely related nature of the previous ex vivo and recent in vivo studies, and our previous detailed reference to Dr. Ni and his colleagues work, we felt, at the time, that it was unnecessary to reference the papers once again. This in no part was an attempt to purposely omit their work and we believe that the current electronic literature searching allows all interested readers to find Dr. Ni and his colleagues previously published literatures which are listed in the Reference section of our study without great difficulty.

Jeong Min Lee, MD,

Joon Koo Han, MD

Department of Radiology, Seoul National University Hospital, 28 Yongon-dong, Chongno-gu, Seoul 110-744, Korea.

### References

1. Lee JM, Han JK, Chang JM, et al. . Radiofrequency ablation of the porcine liver in vivo: Increased coagulation with an internally cooled perfusion electrode. *Acad Radiol*. 2006; 13:343-52.